

SMOKE FLIES (DIPTERA: PLATYPEZIDAE) AND THE SYDNEY BUSHFIRES

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Abstract

Swarms of the smoke fly *Microsania australis* Collart were found at a smoking log in Royal National Park, New South Wales, three weeks after the area was burnt by severe bushfires. The attraction of *Microsania* to smoke for mating assembly is discussed.

Introduction

In early January 1994, bushfires burnt large regions of eastern New South Wales, including some Sydney suburbs. The bushfires were severe in Royal National Park, a large area of natural bushland south of metropolitan Sydney. More than 80% of the park was burnt, including most of the northern half. On January 29, three weeks after the fires, I visited the Park. The landscape was open and desolate, with the dense mallee heathland reduced to a thick grey ashbed and a few charred sticks. In the dry sclerophyll woodland many trees were dead and fallen and standing trees were badly seared.

The bushfires took a heavy toll of fauna, including insects. A few ants from surviving underground colonies were foraging, otherwise there was no observable ground fauna. Native cockroaches, beetles and centipedes had been baked in place under sandstone slabs. I saw few flying insects during a ten kilometre walk through burnt heath and woodland. Near the Curra Moors track roadhead I noticed smoke issuing from a log. This was unusual since the fires had been "out" for almost three weeks and it had rained during that time. A large fallen *Angophora costata* trunk and its stump were both smoldering and the log was almost entirely burnt out. Swarms of tiny flies were present in smoke from both the log and stump, with some 150-200 individuals in each swarm. Of 68 individuals taken in a sweep, there were 66 males and 2 females of *Microsania australis* Collart (Platyepezidae), confirmed by the genitalic figure in Collart (1938).

Microsania Zetterstedt is a cosmopolitan genus with four described Australian species (Chandler 1994). They are commonly known as "smoke flies" because they form mating swarms in woodsmoke. Indeed, collectors suggest lighting smoky fires with green wood to attract them. Kessel (1960a, b) notes that *Microsania* is attracted to cold smoke used by bee-keepers and even to shirts previously worn in woodsmoke.

Discussion

Although *Microsania australis* is attracted to woodsmoke, its concentration in large numbers in such a devastated landscape raises questions:

1. Where did they come from? Nothing is known of the immature stages of *Microsania* (Kessel 1987) but other platypezid genera have fungus-feeding larvae. Nevertheless, the intensity of the bushfires would have destroyed most larvae within the main burn. The nearest source of unburnt or slightly

burnt bushland was Bola Creek, 3-4 km to the west.

2. When did they arrive? The main bushfire would have been too hot and turbulent to attract the flies. I suspect *M. australis* came into the area after the main blaze was extinguished but while logs were still smoldering. As fires died out, the smoke flies probably gathered at remaining smoke, and the smoldering trunk was possibly the last source over a wide area.

The sex ratio of the *M. australis* sample (66 ♂♂, 2 ♀♀) is typical of an aerial mating swarm (Downes 1969). In many insects, aerial swarming is initiated by environmental cues such as light intensity and relative humidity. However it seems that *Microsania* spp. use smoke in two ways: as an aggregating "scent" to concentrate dispersed individuals of both sexes and as a swarm marker, the actual smoke plume delimiting the swarm boundary (individuals rarely leave the plume and follow as it shifts).

Kessel (1989) suggested that attraction to smoke was a positive response to concentrate individuals in areas recently burnt by forest fires, and that *Microsania* bred in fungi specifically associated with fire-scarred wood. However, this hypothesis has yet to be documented, as larvae and their hosts are unknown. If this were the case, one would expect *Microsania* to be co-adapted with fire-ecology vegetation, such as the eucalypt forests of Australia or chaparral of California. However, smoke flies also occur in northwestern Europe and Central African rainforest where natural fires are exceedingly rare. In these moist regions they often appear in large numbers around smoky fires (e.g. Chandler 1978). Therefore, although *Microsania* is distinctly attracted to smoke for mating, it must have other means of aggregation and swarming in the absence of fire. Possibly they are attracted to certain plant aromatics which also facilitate aggregation.

References

- CHANDLER, P.J. 1978. Some dipterous opportunists at Windsor Forest, Berks.: the attractions for flies of bonfires, wood ash and freshly cut logs. *Entomologists Gazette* 29: 253-257.
- CHANDLER, P.J. 1994. The Oriental and Australasian species of Platypezidae (Diptera). *Invertebrate Taxonomy* 8: 351-434.
- COLLART, A. 1938. Description d'un *Microsania* nouveau d'Australie (Diptera: Platypezidae). *Bulletin Musée royal d'Histoire naturelle de Belgique* 14 (16): 1-4.
- DOWNES, J.A. 1969. The swarming and mating flight of Diptera. *Annual Review of Entomology* 14: 271-298.
- KESSEL, E.L. 1960a. The response of *Microsania* and *Hormopeza* to smoke (Diptera: Platypezidae and Empididae). *Pan-Pacific Entomologist* 36: 67-68.
- KESSEL, E.L. 1960b. *Microsania*s attracted to cold smoke. *Wasmann Journal of Biology* 18: 312-313.
- KESSEL, E.L. 1987. Platypezidae. Pp 681-688, in J.F. McAlpine, et al., *Manual of Nearctic Diptera* Vol 2. Research Branch Agriculture Canada Monograph 28, Ottawa, 1332 pp.
- KESSEL, E.L. 1989. *Autobiographical Anecdotes*. Myia 2, San Francisco, 231 pp